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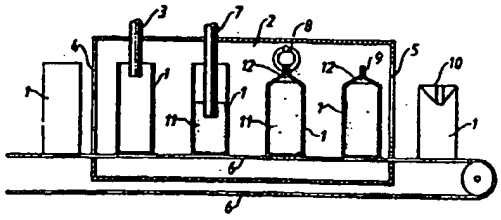
(54) A method for the packaging of oil, in particular edible oil, in flexible packages.

(57) The invention relates to a method for the packaging of edible oil in flexible packages (1) without a risk of deformation of the packages such as occurs as the air enclosed in the packages readily dissolves in the edible oil and creates a partial vacuum in the package (1). This problem is solved in that the edible oil beforehand is saturated with nitrogen gas (N_2) and that the packing operation is performed in a chamber (2) wherein a nitrogen gas atmosphere prevails. As a result of this process the sealed package (1) on the one hand will contain edible oil saturated with nitrogen, which means that the edible oil in principle is unable to absorb any more nitrogen gas, and on the other hand the gas which is enclosed in he package (1) consists of just nitrogen gas, which means that the edible oil cannot absorb and dissolve the gas which is enclosed in the package (1)

Fig. 1



EP 0 339 491 A1

A METHOD FOR THE PACKAGING OF OIL, IN PARTICULAR EDIBLE OIL, IN FLEXIBLE PACKAGES

The present invention relates to a method for the packaging of oil, in particular edible oil, in flexible packages without a risk of deformation of the package on storage. It is known that oil, e.g. edible oil, is packaged and supplied in flexible packages of plastic material or plastic-coated paper. It is also a known fact that these packing containers after storage for a certain time tend to be deformed through caving in of the wall sides of the package. This phenomenon occurs mainly in those packages where the packing container is not wholly filled but where a gas-filled space exists which occupies the volume of the packing container which has not been taken up by the contents proper. This gas volume, formed because the packing container cannot be filled completely with contents, is generally referred to in the trade as "headspace".

The closing of a package can be done in many different ways. It is possible, for example, to fit a cap on a neck or flange arranged beforehand and provided with threads, a wafer or cover strip can be fitted over an opening hole, or a closure may be formed through folding of the packing material which is made tight and mechanically durable through, for example, heat-sealing, which implies that surfaces of the packing material pressed against one another are fused together owing to heat being furnished at the same time as the surfaces intended for sealing are pressed against one another by external devices. In the latter case, of course, the packing material must be of the kind which allows heat-sealing, which is true of most thermoplastics. The packing containers formed by folding referred to here are manufactured mostly from a laminate material comprising a carrier layer of cardboard which has thermoplastic coatings on both sides.

On the occasion of sealing the packing container is thus filled on the one hand with the contents introduced and on the other hand with the gas volume which has been enclosed together with the contents. Since packages in general are filled and sealed in air, the said air volume or gas cushion consists mostly of air, that is to say of a mixture of mainly oxygen gas and nitrogen gas. It has been found that e.g. edible oil has a very good dissolving power for gases of the type of oxygen gas and nitrogen gas and that the dissolving, at least initially, occurs very rapidly. If the contents are constituted of oil, e.g. edible oil, the gas in the gas cushion, therefore, will dissolve relatively rapidly in the oil, whereby it occupies a substantially smaller volume than in undissolved state. Thus a "potential vacuum" occurs in the package which entails a deformation of the package wall as the outer pressure will be higher than the pressure inside the package. It is worth noting that a certain gas passage also occurs through the packing material so that oxygen gas and nitrogen gas penetrate the packing material and enter into the package. This penetration of outside air, however, is substantially slower than the solution of nitrogen gas and oxygen gas in the oil, so that the deformation phenomenon will occur after a relatively short period of storage. The problem can be solved by using packages of a packing material which is so firm that it is not deformed, and it is known that sheet metal packages frequently have been used for the packaging of oils.

One disadvantage of packages with air inclusion is that the atmospheric oxygen on dissolving in the oil contributes to oxidation processes which impair the quality of the oil and, in the case of edible oil, its taste. The air cushion which is formed in the packaging of oil thus has a double negative effect.

The disadvantages mentioned here can be remedied, however, by the present invention which is characterized in that the oil prior to the occasion of packaging is made to absorb nitrogen gas (N_2) which dissolves in the oil, and it is advantageous for the oil to be saturated with nitrogen gas and for the packaging to take place in a nitrogen atmosphere, so that the gas-filled space formed in the package after sealing will contain nitrogen gas (N_2).

The invention will be described in the following with reference to the attached drawing, wherein

Figure 1 shows a schematic sketch of the filling procedure, whereas

Figure 2 shows graphically the connection between the air absorption of the edible oil which has been saturated with nitrogen and the edible oil which has not been saturated with nitrogen respectively.

In the following description it is assumed that the package is constituted of a package body consisting of plastic-coated paper or cardboard in the form of sheets or of a web, the material being formed to a tube in that the longitudinal edges of the sheet or the web are joined to one another in a tight joint and that at least one end of the package is closed in that the end parts of the tube after the filling are joined together and flattened and that they are sealed to one another with the help of heat and pressure, whereafter the sealed end parts of the tube can be shaped to an end wall through folding along folding lines provided beforehand.

The invention may be applied, of course, to types of packages other than those mentioned here, but since packages of this type frequently are relatively thin-walled the deformation problem occurs more often on such packages.

When the package which is constituted of a tube of arbitrary cross-section has been formed and been provided in optional manner with an end wall, the packing container 1 is introduced into a separately arranged chamber 2 in the manner as shown in Fig. 1. In the chamber 2 a nitrogen gas atmosphere is maintained by introducing nitrogen gas through the feed pipe 3, and in order to prevent air from entering the chamber 2 steps are taken to ensure that the pressure of nitrogen gas in the chamber 2 is somewhat higher than atmospheric pressure. Nitrogen gas will leak out through the inlet opening 4 of the chamber 2 and its outlet opening 5 and in order to prevent excessive leakage of nitrogen gas the openings 4 and 5 can be provided with plastic or rubber flaps which essentially seal off the space of the chamber except during the passage in and out of the packages 1 when the said sealing components are moved aside. The packages 1 are passed through the chamber 2 with the help of a conveyor belt 6 on which the packing containers 1 are arranged. In the chamber is provided, moreover, a filling pipe 7 for the contents and a closing device 8.

The package 1 which is empty but provided with a base is placed on a conveyor belt 6 with the opening of the package directed upwards and with the help of the conveyor belt the package 1 is introduced into the chamber 2 by passing through the inlet opening 4. In the chamber 2 is maintained a pressure of nitrogen gas (N_2) and nitrogen gas is introduced continuously through the inlet duct 3 which is directed so that a nitrogen gas stream will be directed down into each packing container introduced as it passes by the inlet duct 3. Through this arrangement the air in the packing containers 1 is effectively flushed out and the containers 1 are filled with nitrogen gas. The packing containers 1 are conducted further by means of the conveyor belt 6 to a station where a filling pipe 7 is directed down into the package, whereafter the latter is filled with the intended product, that is to say in the present case edible oil which has been saturated with nitrogen gas. As mentioned earlier, edible oil cannot be filled up to the top edge of the package 1, partly because the oil would run out owing to the movements which occur at the movement of the package with the help of the conveyor belt 6, and partly because the surfaces which are to be sealed to one another must not come into contact with the edible oil, since the sealing would then become difficult or rendered impossible. A further reason which applies to the present case is that the upper part of the package is constituted of lugs which jointly are to form the end wall of the package in that the lugs are folded in over the package. This means that the package cannot be filled completely, since the final volume is considerably smaller than the volume the package takes up before closing. It has to be accepted, therefore, that a certain part of the package will contain a gas cushion which, however, in the present case will be constituted of nitrogen gas, since the atmosphere inside the chamber 2 is constituted of nitrogen gas. After the filling operation, the packing container is transported to the closing device 8 where in the presence of heat and pressure sealing jaws press together the upper edge zones of the package 1, so as to form a sealing fin 9. The package 1 is now sealed and is removed from the chamber 2, whereafter outside the chamber 2 the package 1 can be finished by folding so that it obtains a plane end wall 10. The edible oil 11 which is filled in through the filling pipe 7 has been treated beforehand in such a manner that it has become saturated with nitrogen gas (N_2). This may be done in that the oil is stored during a long period in a tank where the air has been replaced by nitrogen gas, or in that the oil in some other manner is brought into contact with a nitrogen gas atmosphere so that it is made possible for the nitrogen gas to dissolve in the oil and be absorbed by the same. As is evident from Fig. 1, a space 12, so-called headspace, is formed during the sealing which in the case described here is filled with nitrogen gas, since a nitrogen gas atmosphere prevails inside the chamber 2. Owing to the edible oil 11 in the package having been saturated already with nitrogen gas, the quantity of nitrogen gas which is enclosed in the space 12 cannot be absorbed by the edible oil, and the potential vacuum accompanied by the characteristic caving in of the wall portions of the package, which is common in oil packages containing untreated oil, is not experienced.

The dissolving power of the edible oil for air is exemplified in Fig. 2 which shows a diagram wherein the horizontal axis indicates the time in days along a linear scale and the vertical axis indicates how much air is absorbed by 200 ml edible oil. The vertical axis is graded in millilitres. The curve designated by 13 represents edible oil which has not been pretreated through nitrogen saturation, whereas the curve 14 represents edible oil which has been saturated with nitrogen gas. As is evident from the curve according to Fig. 2. the curves 13 and 14 separate from one another already after a few days, and after six days the air absorption in the untreated edible oil can be read as approx. 8.5 ml, whereas the corresponding figure for edible oil which previously has been satu-

rated with nitrogen gas is only approx. 2.5 ml. The absorption of air in the treated edible oil is thus approx. three times greater than in the treated edible oil, and a gas absorption which is even less is obtained if the measurement is carried out with nitrogen gas only as an absorption gas. It is possible, therefore, by saturating edible oil beforehand with nitrogen gas, which gas does not cause any lowering of the quality of the oil, to achieve the advantage that the package wherein the edible oil is stored is not deformed, at the same time as the quality of the edible oil is better maintained. It is correct in itself that packages containing edible oil, which are deformed owing to the absorption of the air enclosed in the package are being reinflated after some time owing to air, or gases occurring in air, penetrating the walls of the package. Such a refilling of the package does not occur in all types of packages, and where it does happen, so much oxygen gas has been introduced as a rule as to render the edible oil unusable or, in any case, greatly reduced in quality.

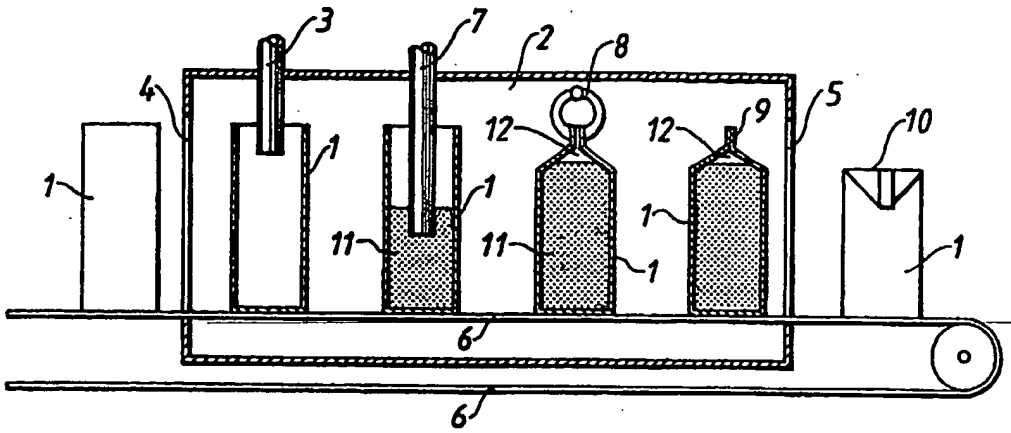
It is thus possible by means of the method in accordance with the invention on the one hand to retain the shape of the package even after long-term storage, and on the other hand to protect the packed edible oil. It is a further advantage that the method for realization of the invention is relatively simple and inexpensive.

Claims

1. A method for the packing of oil, in particular edible oi, in flexible packages without a risk of deformation of the package on storage, **characterized in that** the oil prior to the occasion of packaging is made to absorb nitrogen gas (N_2) which is dissolved in the oil.

2. A method in accordance with claim 1, **characterized in that** the oil is saturated with nitrogen gas and that the packaging takes place in a nitrogen gas atmosphere, so that the gas-filled space (2) formed in the package (1) after sealing will contain nitrogen gas (N_2).

Fig. 1


3
7
2
8
4
5
12
12
9
10
1
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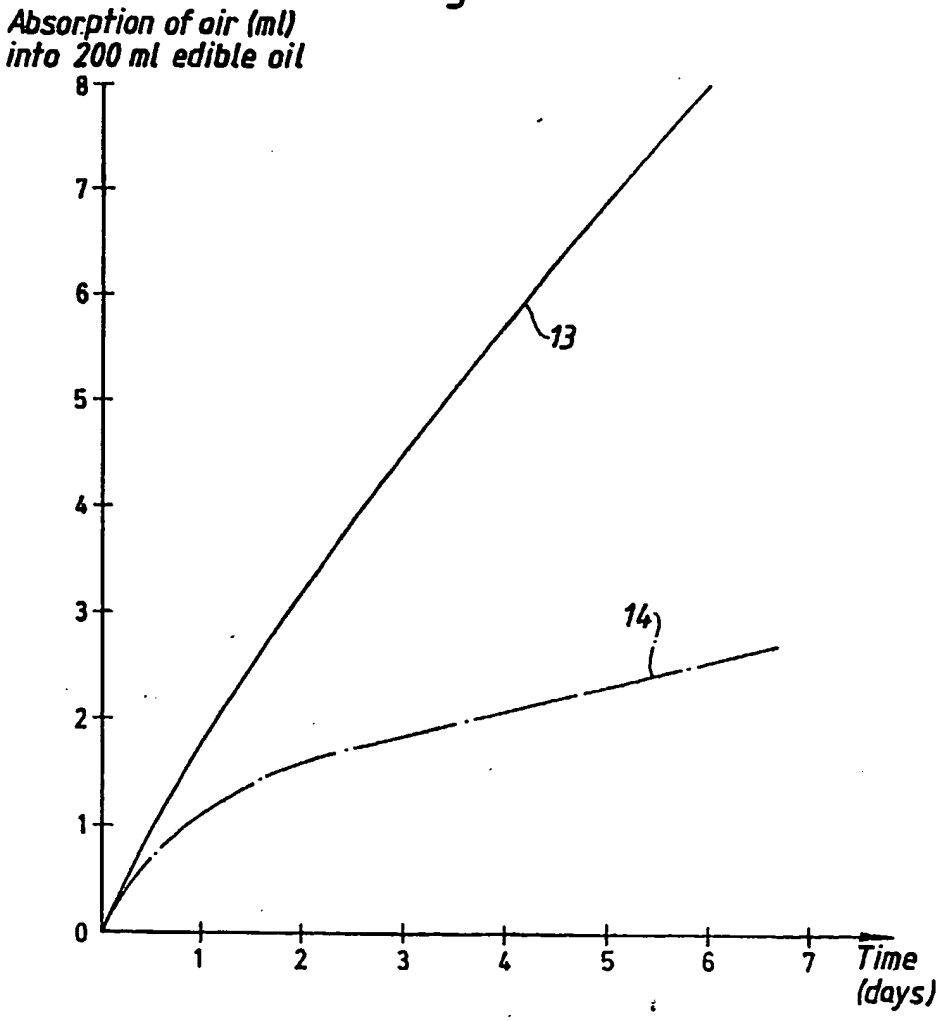
6
6

Fig. 2


Absorption of air (ml)
into 200 ml edible oil
8
7
6
5
4
3
2
1
0
13
14
1
2
3
4
5
6
7
Time
(days)

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 89 10 7128.4

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int Cl 4)
A	JOURNAL OF THE AMERICAN OIL CHEMISTS SOCIETY, Vol 61, No. 3, March 1984, K. WARNER et al "Flavor and Oxidative Stability of Hydrogenated and Unhydrogenated Soybean Oils. Efficacy of Plastic Packaging".	1-2	A 23 D 5/04
A	NETHERLAND MILK DAIRY JOURNAL 27, 1973 p 379-398, C. KEHAGIAS et al "Storage of butler oil under various conditions"	1-2	
A	DE-A-2 039 392 (UNILEVER N.V.)	1-2	
A	FR-A-573 718 (HEYERDAHL P.M.)	1-2	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

A 23 D
B 65 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
STOCKHOLM	04-07-1989	BOIJE JANSON K.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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D : document cited in the application
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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
S6045 PCT		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/ IB 03/ 03557	27/08/2003	09/09/2002
Applicant		
L'AIR LIQUIDE - SOCIETE ANONYME A DIRECTOIRE ...		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

   [ ] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

   [X] None of the figures.